

MSAN 610 - Executive Summary

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September 20, 2016

Online Short-Term Forecast of System Heat Load in District Heating Networks

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2011

This article presents suitable methods for on-line short term forecasting of system heat load in district heating networks (DNH). Analysis was conducted on measurements of the system heat load between 05/18/2006 and 09/22/2010 for 84 buildings in Tanheim, Austria at 30-minute intervals.

A Seasonal AutoRegressive Integrated Moving Average (SARIMA) process was used to model the system heat load as a time series with trends, seasonal patterns and short-term correlations. The SARIMA representation was embedded into the framework of a state-space model to permit short-term forecasting of system heat load of the DNH. The system heat load is defined by a non-stationary random process made up of singular customer heat requests and heat losses from connector pipes.

Performance of the SARIMA model was determined by calculation of rolling Mean Average Percentage Error (MAPE) values over 24 and 48 steps ahead (12 hours and 24 hours ahead respectively) predictions compared to real data. Prediction error was minimized by defining a piece-wise linear function to account for outdoor temperature influences. MAPE(48) was calculated at 4.4% for 24 hours ahead prediction. Social behavior of the consumers with respect to heating demand was also incorporated into the model using a SARIMA process.

Predictions were performed on this test data only. Possible improvements stated by the authors include adding time-varying coefficients to account for annual variations in outside temperature. Future publications will address detailed analysis using time-related variables.